[0021] FIG. 7b illustrates an exemplary extension of the embodiment of FIG. 7a in which more than two click regions can be defined according to embodiments of the invention.

[0022] FIG. 8 illustrates an exemplary computing system operable with a touch sensor panel to implement edge rejection and exceptions to edge rejection according to one embodiment of this invention.

[0023] FIG. 9a illustrates an exemplary mobile telephone that can include a touch sensor panel and computing system for implementing edge rejection and exceptions to edge rejection according to one embodiment of this invention.

[0024] FIG. 9b illustrates an exemplary digital media player that can include a touch sensor panel and computing system for implementing edge rejection and exceptions to edge rejection according to one embodiment of this invention.

[0025] FIG. 9c illustrates an exemplary personal computer that can include a touch sensor panel and computing system for implementing edge rejection and exceptions to edge rejection according to one embodiment of this invention.

[0026] FIG. 10 is a simplified diagram of an exemplary touch pad and display according to one embodiment of this invention.

[0027] FIG. 11 is a perspective view of an exemplary input device according to one embodiment of this invention.

[0028] FIGS. 12A, 12B, 12C and 12D are simplified side views of an exemplary input device having a button touch pad according to one embodiment of this invention.

[0029] FIG. 13 is a simplified block diagram of an exemplary input device connected to a computing device according to one embodiment of this invention.

[0030] FIG. 14 is a side view, in cross section, of an exemplary input device according to one embodiment of this invention.

[0031] FIG. 15 is another side view, in cross section, of the exemplary input device of FIG. 12 according to one embodiment of this invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0032] In the following description of preferred embodiments, reference is made to the accompanying drawings in which it is shown by way of illustration specific embodiments in which the invention can be practiced. It is to be understood that other embodiments can be used and structural changes can be made without departing from the scope of the embodiments of this invention.

[0033] This relates to the selective rejection of touch contacts in an edge region of a touch sensor panel to minimize unintended operations. In addition, by providing certain exceptions to the rejection of edge contacts, the functionality of the touch sensor panel can be maximized.

[0034] FIG. 1a illustrates exemplary touch sensor panel 100 implementing edge rejection according to embodiments of the invention. Edge band 102 (contact rejection region) can be created in an outer boundary of touch sensor panel 100, surrounding center area 104. If all contacts (e.g. fingers or palms) are detected in edge band 102, the contacts can be ignored. In the example of FIG. 1a, because touch images 106 and 108 have centroids 110 and 112, respectively, located in edge band 102, the contacts can be ignored.

[0035] FIG. 1b illustrates a second scenario that can occur on exemplary touch sensor panel 100 according to embodiments of the invention. In the example of FIG. 1b, if contact 114 is detected in center area 104 along with contact 116 in edge band 102, a contact can be recognized in both the center area and the edge band. The recognition of the edge contact in this scenario in accordance with the aforementioned criteria (rejection or recognition criteria) can prevent intended gestures such as pinching gestures with contacts starting in an edge band from being ignored.

[0036] However, when fingers are used to perform an operation such as pointing in center area 104, a so-called "pinky" or other finger inadvertently placed in edge band 102 can be recognized, and an unintended gesture can be performed instead of the pointing gesture. Therefore, in other embodiments of the invention, if contacts 114 and 116 are detected at both center area 104 and edge band 102, and if centroid 118 of edge contact 116 does not move more than a threshold amount (e.g. 1 mm), it can be ignored. However, if edge contact 116 moves more than the threshold amount in any direction (even if there is no other finger detected in the center area), it can be recognized and become a trackable contact that can be part of a gesture. This recognition also allows for tracking operations to be performed within edge band 102.

[0037] FIG. 2 illustrates an exemplary touch sensor panel in the form of trackpad 200 implementing edge rejection according to embodiments of the invention. In the example of FIG. 2, adjacent to trackpad 200 is a conventional keyboard space bar 202 and mechanical pick button 204. Exemplary inadvertent touches illustrated in FIG. 2 can include thumb 206 resting on space bar 202 but also inadvertently resting on trackpad 200. The detected contact at 208 can be ignored so that clicks or other actions are not accidentally generated. In addition, pinky 210 inadvertently touching trackpad 200 can be ignored, and thumb 212 resting on pick button 204 but also overhanging the bottom of the trackpad at 214 can be ignored to avoid it being recognized as part of an unintended pinch gesture.

[0038] FIG. 3a illustrates another exemplary touch sensor panel 300 implementing edge rejection according to embodiments of the invention. In the example of FIG. 3a, touch sensor panel 300 can include a bottom region 302 that can normally be reserved for performing certain non-gesture actions. For example, finger taps in bottom region 302 can be interpreted as a "click" or selection function. Thus, contacts in bottom region 302 can normally be ignored for all purposes except these functions. Nevertheless, it can be desirable to have contacts in bottom region 302 recognized as part of a gesture in certain circumstances. Therefore, according to some embodiments of the invention, in accordance with rejection or recognition criteria, contacts 304 identified as a finger (i.e. a non-concentric image of touch of a certain threshold size) occurring within the bottom region can be ignored if centroid 306 is stationary, but can be recognized as part of a gesture if the centroid is not stationary. Identification of touch events is disclosed in U.S. Pat. No. 6,323,846 entitled "Method and Apparatus for Integrating Manual Input," the contents of which are incorporated herein by reference in its entirety for all purposes. Stationary, as defined herein, is when the centroid moves less than a threshold amount from a computed centroid center, or remains below some speed threshold. If the difference between an instantaneous position and a low pass filter (LPF) averaged position value exceeds a certain threshold value, the centroid can be considered in motion and no longer stationary. Using this criteria, contacts